

CLAIMS

What is claimed is:

1. A method enabling multistage decision making in preflight dispatch
5 of a mobile platform, the method comprising:

extending an entropy-based value of information (VOI) diagnostic
model to preflight dispatch to accommodate one or more variables
associated with preflight dispatch of a mobile platform;

10 receiving at least one input relating to one or more observed
symptoms indicative of one or more failed components of the mobile
platform; and

automatically determining a maintenance action for the mobile
platform in accordance with the extended VOI diagnostic model and the
one or more observed symptoms.

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2. The method of claim 1, wherein the entropy-based VOI diagnostic
model is constructed based upon at least one of systemic information relating to
components of the mobile platform and input-output relationships of the
components, experience-based information relating to direct relationships
20 between component failures and observed symptoms, and factual information
relating to component reliability.

3. The method of claim 2, wherein the construction of the entropy-
based VOI diagnostic model and the extended VOI diagnostic model are based
25 upon a Bayesian network.

4. The method of claim 1, wherein the automatically determining
includes automatically determining an optimal maintenance action for the mobile
platform in accordance with the extended VOI diagnostic model and the one or
30 more observed symptoms.

5. The method of claim 1, wherein the automatically determining
includes automatically prioritizing one or more tests and remedial actions for the

mobile platform over multiple stages in accordance with the extended VOI diagnostic model and the one or more observed symptoms.

5 6. The method of claim 1, wherein the maintenance action includes at least one of:

 performing a test to refine a prioritization of the plurality of suspect components;

 repairing a suspect component;

 replacing a suspect component;

10 deferring maintenance on a suspect component;

 delaying a flight;

 canceling a flight; and

 canceling a flight and replacing the mobile platform.

15 7. The method of claim 1, wherein the automatically determining includes:

 correlating the at least one input relating to the one or more observed symptoms with one or more suspect components each capable of causing the one or more observed symptoms upon failure in
20 accordance with the extended VOI diagnostic model;

 prioritizing the one or more suspect components based upon a relative likelihood that the respective suspect components caused the one or more observed symptoms;

25 identifying and prioritizing one or more tests that can each be performed to refine the prioritization of the one or more suspect components; and

 using the prioritized listing of tests to identify a test to perform or determine that testing should stop.

30 8. The method of claim 1, further comprising:

 receiving at least one input relating to an outcome of a test; and

 re-determining the maintenance action in light of the outcome of the test.

9. The method of claim 1, further comprising:
receiving at least one input relating to a remedial action undertaken
with respect to at least one suspect component; and
re-determining the maintenance action in light of the remedial
action.

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10. The method of claim 1, further comprising identifying the one or
more variables associated with preflight dispatch.

10 11. The method of claim 1, wherein the one or more variables
accommodated by the extended VOI diagnostic model includes at least one of:

a decision parameter;
a utility function;
a constraint;
a cost function;
a cost limit;
a time deadline;
an airworthiness guideline;
maintenance crew expertise;
labor availability;
a future destination of the mobile platform;
repair equipment availability; and
component availability.

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25 12. The method of claim 1, wherein the one or more variables
accommodated by the extended VOI diagnostic model includes:

a test decision; and
a repair decision interleaved with the test decision.

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13. The method of claim 12, wherein:
the test decision includes at least one of:
performing a test to refine a prioritization of the plurality of
suspect components; and

stopping testing and addressing the repair decision;
the repair decision includes at least one of:
repairing a suspect component;
replacing a suspect component;
5 deferring maintenance on a suspect component;
delaying a flight;
canceling a flight; and
canceling a flight and replacing the mobile platform.

10 14. The method of claim 13, wherein the test decision is stopping testing and addressing the repair decision when no test having a positive value of information (VOI) or an estimated time and cost of completion within cost and time constraints prescribed for dispatch of the mobile platform can be identified.

15 15. The method of claim 13, wherein the test to perform includes a positive net VOI and an estimated time and cost of completion within cost and time constraints associated with the dispatch of the mobile platform.

16. A system enabling multistage decision making in preflight dispatch of a mobile platform, the system comprising:

at least one input relating to one or more observed symptoms indicative of one or more failed components of a mobile platform;

5 a computer executable module for extending an entropy-based value of information (VOI) diagnostic model to preflight dispatch to accommodate one or more variables associated with preflight dispatch of a mobile platform; and

10 a computer executable module for automatically determining a maintenance action for the mobile platform in accordance with the extended VOI diagnostic model and the one or more observed symptoms.

17. The system of claim 16, wherein the entropy-based VOI diagnostic model is constructed based upon at least one of systemic information relating to components of the mobile platform and input-output relationships of the components, experience-based information relating to direct relationships between component failures and observed symptoms, and factual information relating to component reliability.

20 18. The system of claim 17, wherein the construction of the entropy-based VOI diagnostic model and the extended VOI diagnostic model are based upon a Bayesian network.

25 19. The system of claim 16, wherein the automatically determined maintenance action includes an optimal maintenance action for the mobile platform in accordance with the extended VOI diagnostic model and the one or more observed symptoms.

30 20. The system of claim 16, wherein the computer executable module for automatically determining a maintenance action includes a computer executable sub-module for automatically prioritizing one or more tests and remedial actions for the mobile platform over multiple stages in accordance with the extended VOI diagnostic model and the one or more observed symptoms.

21. The system of claim 16, wherein the computer executable module for automatically determining a maintenance action includes:

a computer executable sub-module for correlating the at least one input relating to the one or more observed symptoms with one or more suspect components each capable of causing the one or more observed symptoms upon failure in accordance with the extended VOI diagnostic model;

a computer executable sub-module for prioritizing the one or more suspect components based upon a relative likelihood that the respective suspect components caused the one or more observed symptoms;

a computer executable sub-module for identifying and prioritizing one or more tests that can each be performed to refine the prioritization of the one or more suspect components; and

a computer executable sub-module for using the prioritized listing of tests to identify a test to perform or determine that testing should stop.

22. The system of claim 16, further comprising:

at least one input relating to an outcome of a test; and

a computer executable module for re-determining the maintenance action in light of the outcome of the test.

23. The system of claim 16, further comprising:

at least one input relating to a remedial action undertaken with respect to at least one suspect component; and

a computer executable module for re-determining the maintenance action in light of the remedial action.

24. The system of claim 16, further comprising at least one database including at least one of component data, test data, and data relating to the correlation between observed symptoms and suspect components.

25. The system of claim 16, further comprising an output component for outputting the automatically determined maintenance action to a user.

26. A method enabling multistage decision making in a maintenance troubleshooting operation, the method comprising:

5 extending an entropy-based value of information (VOI) diagnostic model constructed based upon at least one of systemic information relating to components of a mobile platform and input-output relationships of the components, experience-based information relating to direct relationships between component failures and observed symptoms, and factual information relating to component reliability, the extended VOI diagnostic model accommodating one or more variables associated with the maintenance troubleshooting operation;

10 receiving at least one input relating to one or more observed symptoms indicative of one or more failed components of the mobile platform; and

15 automatically determining a maintenance action for the mobile platform in accordance with the extended VOI diagnostic model and the one or more observed symptoms.

27. The method of claim 26, wherein the extending includes extending the entropy-based value of information (VOI) diagnostic model to preflight dispatch to accommodate one or more variables associated with preflight dispatch of the mobile platform.

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28. The method of claim 26, wherein the construction of the entropy-based VOI diagnostic model and the extended VOI diagnostic model are based upon a Bayesian network.

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29. The method of claim 26, wherein the automatically determining includes automatically determining an optimal maintenance action for the mobile platform in accordance with the extended VOI diagnostic model and the one or more observed symptoms.

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